

ABSTRACT OF THE DISCLOSURE

An apparatus and method for modulating an optical beam by modulating a photonic band gap of a photonic crystal lattice. In one embodiment, an apparatus according to embodiments of the present invention includes a photonic crystal lattice in first semiconductor material. The first semiconductor material has a plurality of holes defined in the first semiconductor material. The plurality of holes are periodically arranged in the first semiconductor material with a hole pitch and a hole radius that define the photonic crystal lattice. The apparatus also includes second semiconductor material regions disposed proximate to and insulated from respective inside surfaces of the plurality of holes defined in the first semiconductor material and charge modulated regions, which are to be modulated in the second semiconductor material regions. An optical beam is to be directed through the photonic crystal lattice and is to be modulated in response to a modulated effective photonic band gap of the photonic crystal lattice. The effective photonic band gap modulated in response to the charge modulated regions.